



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY  
FACULTY OF APPLIED SCIENCE  
DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY  
BACHELOR OF SCIENCE HONOURS DEGREE IN APPLIED BIOLOGY AND  
BIOCHEMISTRY

ADVANCED MOLECULAR CELL BIOLOGY (SBB 4204)

Main Examination Paper

MARCH 2025

This examination paper consists of 2 pages

Time Allowed : 3 hours  
Total Marks : 100  
Special Requirements: NONE  
Examiner's Name : MISS T. B. MGUNI AND MR D. NDEBELE

**INSTRUCTIONS**

1. Answer four (4) questions. Each question carries 25 marks.
2. Where a question contains subdivisions, the mark value for each subdivision is given in brackets.
3. Illustrate your answer where appropriate with large, clearly labelled diagrams.

**MARK ALLOCATION**

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
6.	25
<b>TOTAL</b>	<b>100</b>

1. (a) Describe the process of modifying a Ti plasmid and transforming plant cells. (10 marks)  
(b) Using specific examples, describe the characteristics of bacteriophage vectors, highlighting their advantages and limitations. (15 marks)
2. Discuss the following, highlighting significance and applications:  
(a) Molecular structure of interphase chromosomes in eukaryotes. (15 marks)  
(b) Banding patterns in mitotic chromosomes. (10 marks)
3. (a) Discuss the role of plant growth hormones in plant tissue culture (10 marks)  
(b) Describe the use of selectable marker genes, detailing the technique of blue-white screening. (15marks)
- 4.(a) Discuss the molecular mechanisms that regulate the damage checkpoints in the somatic cell cycle. (12 marks)  
(b) Describe the "licensing" and "firing" of the origin of replication during the G1 and S phases respectively of the cell cycle. (6 marks)  
(c) Give an account of the dysregulation of the Spindle Assembly Checkpoint (SAC), highlighting the therapeutic strategies that can be used to target SAC dysregulation. (7 marks)
- 5.(a) (i) Describe the structure and assembly dynamics of microtubules. (5 marks)  
(ii) Outline the role of intermediate filaments in cells. (5 marks)  
(b) Critically evaluate the contrasting roles of kinesins and cytoplasmic dyneins in intracellular transport, including their modes of action. (15 marks)
- 6.(a) Discuss the role of cell polarity in the movement of fibroblasts. (10 marks)  
(b) Explain how defects in the components of the MHC class I antigen presentation pathway can lead to immune evasion by pathogens. (15 marks)

**END OF EXAMINATION**